ABSTRACT

The present invention is directed to an echo canceller adapted for use in a communication system that includes a hybrid circuit. The echo canceller comprises an adaptive digital filter that generates an estimated echo signal $\hat{z}[k]$ in response to: (i) a sampled input data sequence $x[k]$ and (ii) an error signal sequence $e[k]$ indicative of the difference between a near end signal sequence $y[k]$ and the estimated echo signal $\hat{z}[k]$. The adaptive digital filter computes filter coefficients based upon the error signal sequence $e[k]$ using a stochastic quadratic descent estimator, such as for example a least mean square (LMS) estimator, that employs a dynamically adjustable step size vector $\underline{\mu}[k]$. The adaptive digital filter computes the dynamically adjustable step size vector $\underline{\mu}[k]$ of the form $\underline{\mu}[k+1] = \underline{\mu}[k] + \alpha\underline{\phi}[k] \bullet \underline{x}[k]e[k]\Big|_{\mu_{min}}^{\mu_{max}}$, where $\underline{\phi}[k+1] = \underline{\phi}[k] \bullet (\underline{1} - \underline{\mu}[k] \bullet \underline{x}^2[k]) + e[k]\underline{x}[k]$ and α is a scalar. In an open loop embodiment, the dynamically adjustable step size vector $\underline{\mu}[k]$ equals to $\underline{\mu}[k] = \mu[k]\underline{1}$, that is, all elements of the vector take the same value collapsing to the particular case of a scalar. The step size is computed using an expression of the form $\mu[k+1] = \mu[k] + \xi[k]$, where $\xi[k]$ is an empirically derived set of values.